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STUDY ON ALTERNATIVES COMPARISON OF RELAY SATELLITE BASED ON LASER LINKS

**Abstract**

With the space communication data rate's advancing and the bandwidth's increasing, the earth observation system's doubling volume and higher resolution, a new space data relay system is demanded to meet the requirements of mass data transmission at a higher rate, while more and more civil users and commercial users are emerging such as launch vehicles, aircrafts, space stations, planes and other near space aircraft and oceanic vessels, etc. As the traditional microwave relay transmission is facing the challenges of the crowding frequency band and the decreasing available bandwidth, the optical communication is now becoming a promising transmission method, which has shorter wavelength, wider bandwidth, lower power consumption, smaller volume, lighter weight, higher security in communication, as well as the advantages in wavelength division multiplexing (WDM) technology. Based on the above reasons, many researchers and institutes in the United States, Europe, Japan and China have carried out a lot of intensive study and experimental verification of space optical communication for dozens of years. After the requirement analysis of mass data relay with higher rate for high resolution earth observation systems and the space-based information transmission and distribution systems, several relay satellite schemes equipped with multi laser terminals are put forward to satisfy the GEO-GEO, GEO-LEO, GEO-Ground relay users. The advantages and disadvantages of those relay satellite schemes are compared and analyzed in multiple aspects such as the communication terminals, the demand for the satellite platform, the reliability, the inheritance and the innovation, etc. At the same time, the corresponding configurations are provided based on the DFH-4 satellite platform. In addition to overcome the shortcomings of laser communication, some enhanced methods can be applied such as adaptive optical technology to ensure the good practicability of the relay satellite system.